Liquid cooling coil in alternator casing

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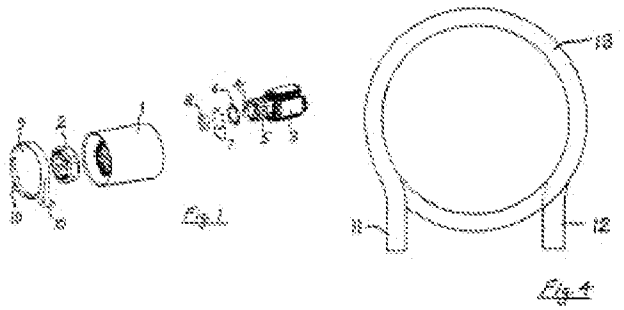
Abstract of **GB2284943**

An alternator for a marine engine comprises a casing (1) which is adapted to contain a stator (2) and a rotor (3). The casing (1) has substantial thickness and is provided in its side wall with a pair of bores. An inlet pipe (11) and an outlet pipe (12) lead through the bores in the casing to a coil (13) in the casing. The inlet pipe is connected to a pump which is arranged, when driven, to deliver cooling water to the coil, the cooling water being expelled from the coil via the outlet pipe. The pump is arranged to be driven whenever the marine engine is running whereby cooling water flows continuously through the coil in order to cool the alternator. The intake to the pump can be taken from the water surrounding a vessel in which a marine engine fitted with the alternator is installed.



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U1S S1835 S1990

(56) Documents Cited
GB 2099232 A GB 0939523 A EP 0231785 A

(58) Field of Search
UK CL (Edition N) H2A AKB3 AKK2
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(54) Liquid cooling coil in alternator casing

(57) An alternator for a marine engine comprises a casing (1) which is adapted to contain a stator (2) and a rotor (3). The casing (1) has substantial thickness and is provided in its side wall with a pair of bores. An inlet pipe (11) and an outlet pipe (12) lead through the bores in the casing to a coil (13) in the casing. The inlet pipe is connected to a pump which is arranged, when driven, to deliver cooling water to the coil, the cooling water being expelled from the coil via the outlet pipe. The pump is arranged to be driven whenever the marine engine is running whereby cooling water flows continuously through the coil in order to cool the alternator. The intake to the pump can be taken from the water surrounding a vessel in which a marine engine fitted with the alternator is installed.

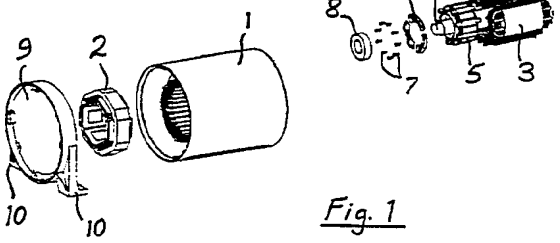

Fig. 1

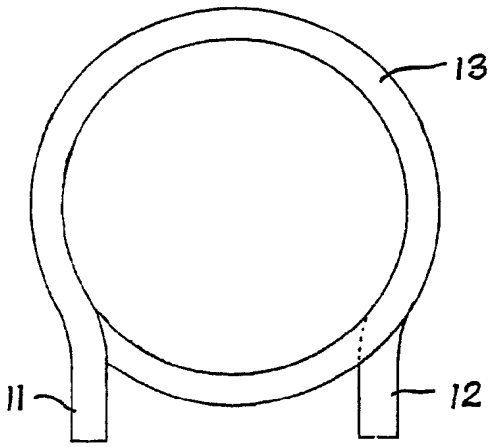

Fig. 4

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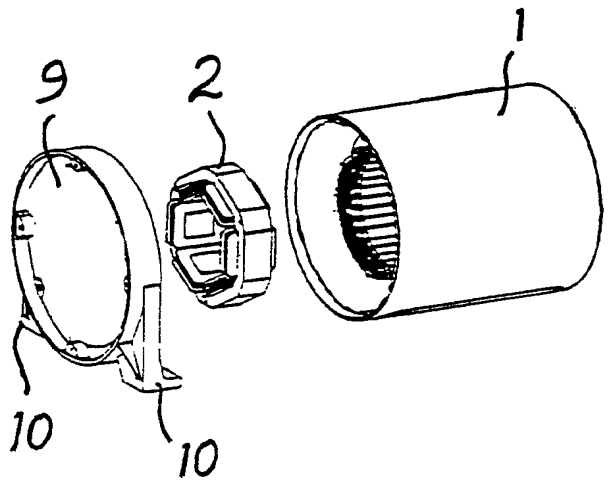

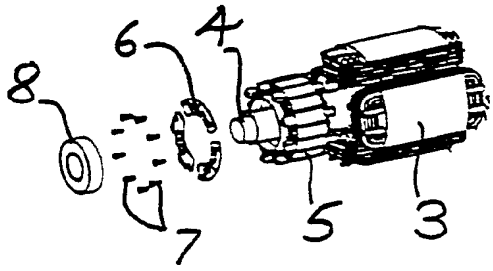

Fig. 1

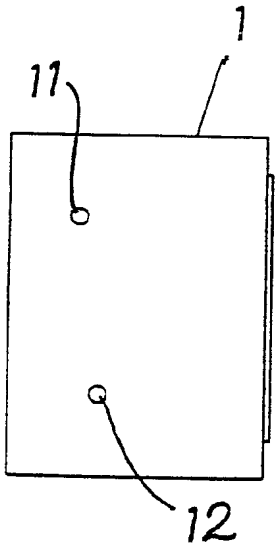

Fig. 2

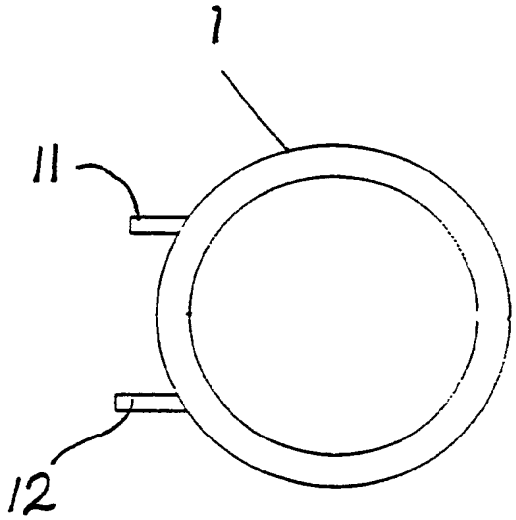

Fig. 3

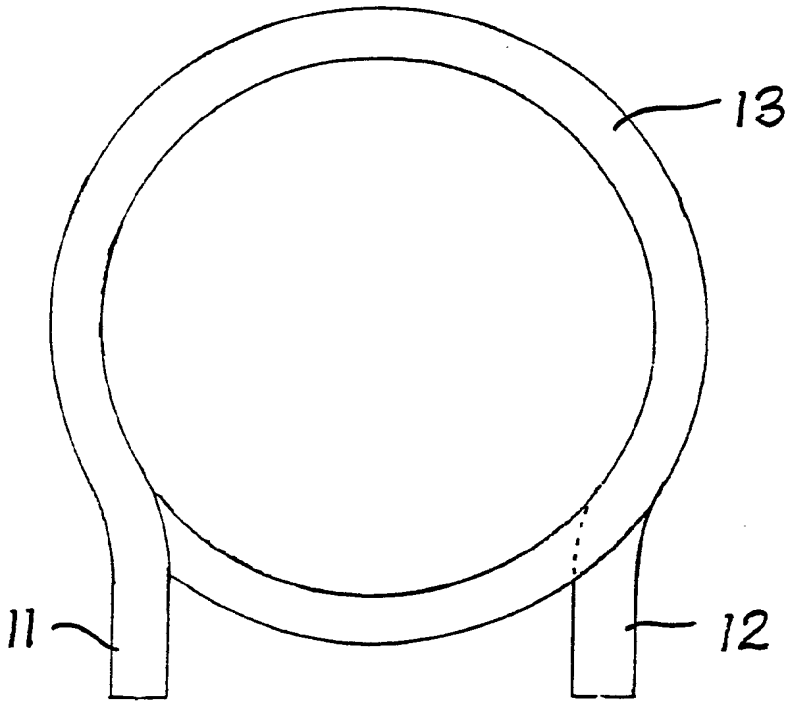

Fig. 4

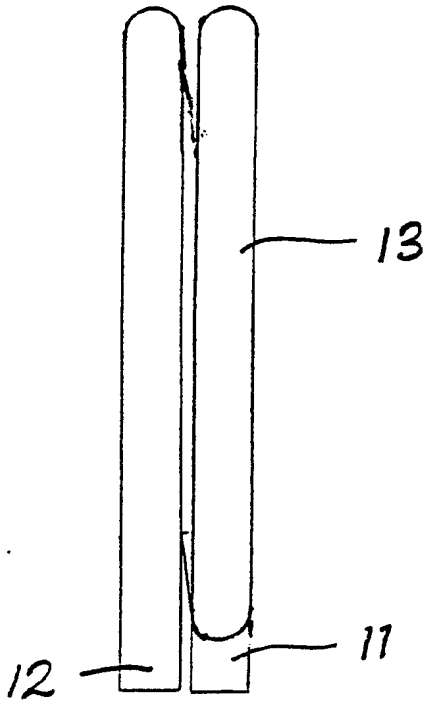

Fig. 5

Title: IMPROVEMENTS IN ALTERNATORS

This invention relates to alternators and is particularly concerned with alternators for marine engines.

As is known, electrical power for petrol or diesel engines is customarily generated by alternators. The process of generating electricity causes a considerable amount of heat to be generated in the stator and rotor windings of an alternator. This heat is conventionally dispersed by means of a fan assembly mounted on the drive side of the alternator. Air for cooling is drawn from the other side of the alternator through the windings and is then expelled. The efficiency of this type of cooling is largely dependent on the temperature of the ambient air. In many applications such as cocooned, marine diesel generators, the ambient air depends on the ambient conditions in the engine compartment. When large propulsion engines, such as those employed for the propulsion of power boats, are switched off, a large amount of stored heat is retained in the engine compartment which in turn is sucked into the alternator. The increased air intake temperature dramatically reduces the efficiency of the alternator and, in extreme cases, can lead to burning out of the alternator windings altogether.

The present invention aims to overcome this problem by cooling an alternator with water, which can be either fresh water or sea water.

According to the invention, there is provided an alternator for a marine engine which comprises a casing adapted to contain stator and rotor windings, wherein a coil is provided which is arranged to surround the stator, the coil taking the form of a hollow tube having an inlet and an outlet leading out of the casing, the inlet being adapted to be connected to a pump and the arrangement being such that, when the pump is driven it is arranged to deliver cooling water to the coil, the water passing round the coil to cool the alternator and being expelled from the coil via the outlet.

The pump can be arranged to be driven by a marine engine equipped with the alternator or by a separate electric motor.

By means of the invention, the alternator will always be effectively cooled when the pump is running regardless of the temperature of the ambient air in the engine compartment. The intake to the pump can be taken from the water surrounding a vessel in which the marine engine has been installed. Thus, the cooling water may be either fresh water or sea water.

In order to minimise corrosion, the coil is preferably made of stainless steel.

According to a preferred embodiment of the invention, the casing is cast from aluminium or a suitable aluminium alloy and the stainless steel coil is desirably cast in the shell of the casing.

The invention will now be further described, by way of example, with reference to the drawings, in which:-

Fig. 1 is an exploded perspective view of one embodiment of an alternator according to the invention;

Fig. 2 is a side elevation of a casing for the alternator shown in Fig. 1;

Fig. 3 is an end elevation of the casing shown in Fig. 2;

Fig. 4 is a front elevation of a coil for incorporation in the casing shown in Figs. 2 and 3; and

Fig. 5 is a side elevation of the coil shown in Fig. 4.

In the drawings, like parts are denoted by like reference numerals.

Referring to the drawings, the alternator according to the invention comprises a casing 1 which is cast from aluminium or a suitable aluminium alloy and which takes the form of a cylindrical shell which is adapted to contain an exciter stator 2 and a rotor 3. An exciter winding 5 is mounted on a shaft 4 of the rotor and a rotating diode bridge 6 is secured by screws 7 to the exciter winding 5 and the rotor shaft 4 is rotatably mounted in a bearing 8 which is also housed in the casing 1 and which may be mounted on a cover 9 which is adapted to engage with and to close one end of the casing 1. The end cover 9 is provided with brackets 10 for securing the cover, and hence the casing 1, to a fixed part of a marine engine or supporting structure (not shown) for which the alternator according to the invention is intended.

As shown in Figs. 2 and 3, the casing 1 has substantial thickness and is provided in its side wall with a pair of bores. An inlet pipe 11 and an outlet pipe 12 of a coil 13 lead through the bores to the coil which is preferably cast in the casing shell 1. The inlet pipe 11 is connected to the output from a pump (not shown) and the outlet pipe 12 is connected to a line which leads out of the engine compartment to discharge cooling water which is pumped from the pump to the inlet 11, circulates round the coil 13 and passes out of the casing 1 through the outlet pipe 12.

It will be seen that, by means of the invention, heat generated by the alternator windings will be effectively absorbed by cooling water circulating through the coil 13 so that the alternator will not overheat, its efficiency will not be impaired and there will be no risk of the windings burning out.

The invention is not restricted to the above-described embodiment but variations and modifications may be made without departing from the scope of the invention. For example, an internal fan may be mounted on the shaft to cause turbulence of the internal cooling air.

CLAIMS

1. An alternator for a marine engine which comprises a casing adapted to contain stator and rotor windings, wherein a coil is provided which is arranged to surround the stator, the coil taking the form of a hollow tube having an inlet and an outlet leading out of the casing, the inlet being adapted to be connected to a pump and the arrangement being such that, when the pump is driven, it is arranged to deliver cooling water to the coil, the water passing round the coil to cool the alternator and being expelled from the coil via the outlet.

2. An alternator according to claim 1, wherein the coil is made of stainless steel.

3. An alternator according to claim 1 or claim 2, wherein the casing is cast from aluminium or an aluminium alloy to form a shell.

4. An alternator according to claim 3, wherein the coil is cast in the shell of the casing.

5. An alternator according to any one of the preceding claims, wherein bores are provided in a side wall of the casing, a first of said bores being connected to one end of the coil and a second of said bores being connected to the other end of the coil.

6. An alternator according to any one of the preceding claims in which the rotor windings are mounted on a shaft, wherein a fan is mounted on the shaft within the casing.

7. An alternator substantially as described herein with reference to the drawings.

8. A marine engine equipped with the alternator claimed in any one of the preceding claims.

9. A marine engine according to claim 8 and including a pump, said pump being connected to the coil of the alternator to deliver cooling water to the coil when the pump is driven.

10. A marine engine according to claim 9, wherein the pump is arranged to be driven by the engine.

11. A marine engine according to claim 9, wherein the pump is arranged to be driven by a separate drive means.

12. A vessel equipped with the marine engine claimed in any one of claims 8 to 11.

The Patent Office

Application No: GB 9325314.4
Claims searched: 1-12

Examiner: Mr John Cockitt
Date of search: 21 March 1995

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.N): H2A [AKK2, AKB3]

Int Cl (Ed.6): H02K [09/08, 09/19, 09/193, 05/20]

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB2099232A	KARCHER - see whole document	1-5
X	GB0939523A	ASSOCIATED ELECTRICAL - see whole document	1,2 at least
X	EP0231785A	MITSUBISHI - see esp figs15,16	1,5,6 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.